Summer 2012

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University of Nebraska

Water Current

PART OF THE ROBERT B. DAUGHERTY WATER FOR FOOD INSTITUTE

MEET THE FACULTY

Larkin Powell, Ph.D.

Larkin Powell is a professor of conservation biology and animal ecology in the University of Nebraska–Lincoln's School of Natural Resources (SNR) since August 2001. He teaches courses in SNR's fisheries and wildlife major, including field courses to the Boundary Waters Canoe Area Wilderness and Puerto Rico. He has an active research lab for M.S. or Ph.D. students and postdoctoral associates.

His areas of study attempt to explain how management of landscapes affects wildlife populations, with many research projects focused on private lands or state/federal properties. Powell's students work on projects assessing grazing management, Farm Bill conservation programs, prescribed burning and other management-related issues. He have worked on projects

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Water for Food
ROBERT B. DAUGHERTY INSTITUTE
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November Law and Science, Practice and Policy Events at Cornhusker Hotel

Back-to-back one-day water science and water law conferences will be at Lincoln's Cornhusker Hotel Nov. 13 and 14.

The annual events are being cosponsored and presented by the University of Nebraska's Nebraska Water Center (NWC), a part of the Robert B. Daugherty Water for Food Institute, the NU College of Law and the U.S. Geological Survey Nebraska Water Science Center (USGS NEWSC).

The separate conferences continue a tradition of packing a lot of information for attorneys, water practitioners and interested public into easy to attend one-day formats, said organizer and NWC assistant director Lorrie Benson.

The Tuesday, Nov. 13 "Water: Science, Practice and Policy" conference will focus on the latest water-related research, programming, practice, and policy in Nebraska and the Great Plains, Benson said. The USGS NEWSC is cosponsoring this event.

The Wednesday, Nov. 14 water conference will focus on information of interest to practicing attorneys, but is open to all. The NU College of Law is cosponsoring this event.

Both days will feature natural resources economist Mark Buckley with ECONorthwest. On Nov. 13 he'll discuss the economics of green infrastructure to meet Clean Water Act requirements, including value for smaller communities. For the lawyers on Nov. 14, Buckley will describe how water and ecosystem services are valued for legal and other purposes, using case studies to illustrate his points.

The science and policy day will open with Eric Evenson discussing "A Water Census for the Nation." Evenson is the USGS national coordinator for the national water census. Next will be "Water Funding: Financing Nebraska's Water Future," which will feature panelists considering alternatives for funding water

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NU, Food and Agriculture Organization Partner on Water and Food Security Efforts

By Melissa Lee, University of Nebraska

The University of Nebraska's Robert B. Daugherty Water for Food Institute and the Food and Agriculture Organization of the United Nations – an international leader in the fight against hunger – have signed an agreement to partner on research and education efforts in water and food security.

NU President James B. Milliken and FAO Deputy Director General of Knowledge Ann Tutwiler signed the Memorandum of Understanding this week in Rome, Italy, where FAO is headquartered. The signing ceremony was part of two days of meetings and consultations between NU and FAO officials, including

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From the Interim Director
Suat Irmak

Moving Into a Busy Fall Schedule

In this issue of the *Water Current* I am very proud for you to share a glimpse of activities we have coming up early this fall, as well as to review projects and activities we have recently completed over the summer.

First, what is coming up: On Nov. 13 we will co-host a one-day "Water: Science, Practice and Policy" conference, with the USGS Nebraska Water Science Center, at Lincoln's Cornhusker Hotel that will focus on the latest water-related research, programming, practice, and policy in Nebraska and the Great Plains. The following day (Nov. 14), at the same location, the NU College of Law will help us cosponsor a water conference focused on information of interest to practicing attorneys, but open to all.

The latest details on these two events are online at watercenter.unl.edu. We look forward to seeing you at either or both events.

Last month we had a very successful and well-received water and natural resources tour looking at damage from and lessons learned from last summer's epic Missouri River flood. Close to 50 tour participants got an in-depth view of flood damage and recovery and what we have learned from this event. We are grateful to our co-sponsors for making this so worthwhile and successful. In particular, Central Nebraska Public Power and Irrigation District, Kearney Area Chamber of Commerce, Nebraska Public Power District, Omaha Public Power District and USGS Nebraska Water Science Center.

I can also report that I had a very well attended and successful field day at the South Central Agricultural Laboratory near Clay Center, the day following the 2012 global Water for Food Conference that was held in Lincoln in late May/early June.

This was a wonderful opportunity to show many of our international colleagues, who were here for the conference, some of our local research on large-scale irrigation engineering and agricultural water management, crop production, crop water productivity, evapotranspiration and variable irrigation/fertigation under center pivot, along with subsurface drip irrigation and other demonstration projects.

Nebraska Water Center interim director Suat Irmak explains irrigation technology advances to field day visitos at Clay Center following the 2012 global Water for Food Conference (IANR photo).

In other news in this issue of the *Water Current*, I want to call

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Tonya Bernadt

Tonya Bernadt is an Education and Outreach Specialist at the University of Nebraska–Lincoln's National Drought Mitigation Center (NDMC), which operates within UNL's School of Natural Resources. She has been at the NDMC since January 2009. She has recently been named project coordinator for a new program called "Climate Masters of Nebraska," as well.

Education:

M.S., Leadership Education, University of Nebraska–Lincoln, 2004
B.S., Natural Resources, University of Nebraska–Lincoln, 2000

Examples of Current Research/Extension Programs:

— Bernadt is currently working on several projects, including the new Climate Masters program. She and Natalie Umphlett and Tapan Pathak worked as a team to obtain U.S. Environmental Protection Agency funding for seed money to start the program. It is an adult education program that was developed to teach participants about climate change and ways to reduce their carbon footprint. The group just completed their first course and is very excited about it.

— She is also involved in two projects funded by NOAA and USDA that involve working with the Center for Research on the Changing Earth System. These grants focus on decadal climate variability (DCV) modeling, dissemination, and working with stakeholders in the Missouri River Basin to help identify how DCV outlooks might be useful to the region and its stakeholders.

— Other current projects include a grant from the Risk Management Agency in which she and the NDMC team are working with ranchers to help them prepare a drought plan that will assist them before, during and after a drought. Bernadt is also a team member on the National Integrated Drought Information Systems (NIDIS) Engaging Preparedness Communities working group.

Examples of Past Research/Extension Programs:

Bernadt has been on a number of varying projects since affiliating with the NDMC. Some of these are; DCV stakeholder projects, RMA drought tools workshops, Republican River Water and Drought Portal, National Weather Service Low Flow Project, assisting with the NDMC website upgrade, and many others.

Examples of Outreach Programs:

NDMC participates in a number of wide-ranging outreach events. Some of these are: Children's Groundwater Festival in Grand Island, Hartley Elementary Community Learning Center after school program, Earth Wellness Festival, Weatherfest, Weather Camp, Naturepalooza and more.

Selected Publications:

Mehta V., C. Knutson, T. Bernadt, J. Olsen, N. Wall, M. Hayes, and N. Rosenberg. 2010. An Assessment of Decadal Drought Information Needs of Stakeholders and Policymakers in the Missouri River Basin for Decision Support.

Metha V., C. Knutson, T. Bernadt, J. Olsen, N. Wall, M. Hayes, and N. Rosenberg. 2011. An Assessment of Decadal Drought Information Needs of Stakeholders and Policymakers in the Missouri River Basin for Decision Support Part III: Urban Water Security in the Missouri River Basin.

Woudenberg, D., M. Svoboda, T. Bernadt, N. Wall, M. Widhalm, J. Okalebo, C. Bergman, S. Jones, and C. Knutson. 2010. Low Flow/Stage Related Impacts in the Upper Colorado River Basin Project Report. Prepared for NOAA's Climate, Water and Weather Service Division.

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Urrea Breeds Drought-Resistant Edible Beans in Western Nebraska

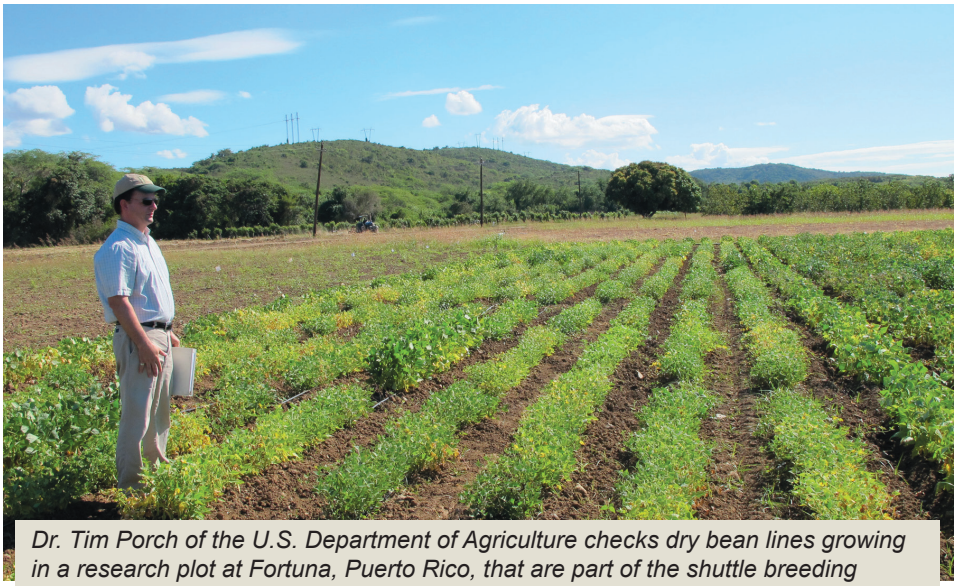
By David Ostdiek, UNL Panhandle Research and Extension Center

When Dry Bean Breeding Specialist Carlos Urrea arrived at the University of Nebraska–Lincoln's Panhandle Research and Extension Center in 2005, western Nebraska was in the middle of its worst drought in decades.

Drought is not the only factor limiting how much water farmers can put on crops; allocations established by natural resources districts also constrain farmers in most of the state's Panhandle.

This is why breeding new dry edible bean cultivars that are more tolerant to drought and heat is one of the main objectives of Urrea's program.

Dry bean germplasm lines with drought tolerance, in addition to disease resistance, and seed quality, are being developed simultaneously in western Nebraska and Puerto Rico as part of a "shuttle breeding project." Urrea is cooperating with the U.S. Department of Agriculture Agricultural Research Service Tropical Agricultural Research Station (USDA-TARS) at Mayaguez, PR.



Dr. Tim Porch of the U.S. Department of Agriculture checks dry bean lines growing in a research plot at Fortuna, Puerto Rico, that are part of the shuttle breeding program between Nebraska and Puerto Rico (UNL Panhandle Research and Extension Center photo).

New dry bean lines are being grown both at Scottsbluff, and at the University of Puerto Rico in Fortuna, according to Urrea. The advantage of this arrangement, he explained, is that he and his colleagues can select for multiple traits in different locations: some traits at one of the sites, other traits at the other site. Then the lines from both sites can be combined.

Urrea selected Puerto Rico because of its warmer climate. He is working beside Dr. Tim Porch of USDA with a goal of developing beans that are adapted to both Puerto Rico and western Nebraska.

Results so far have included the release of two black-bean germplasm lines with heat and drought tolerance in addition to resistance to multiple diseases (common bacterial blight,

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Advisory Board Meets in June

By Steve Ress

The Nebraska Water Center's advisory board met in early June to discuss a variety of current and upcoming issues of importance to the center.

Eight members of the 13-member board met with the Water Center's new interim director, Suat Irmak, and several center staff members on June 18.

Irmak noted that the center, now part of the Robert B. Daugherty Water for Food Institute, becomes part of the wider University of Nebraska with the new affiliation, rather than being a University of Nebraska–Lincoln entity as it was in the past. Much of the center's goals, objectives and day-to-day operations will remain the same however, with continued emphasis on state and regional water quantity and quality issues.

The center remains within UNL's Institute of Agriculture and Natural Resources, but is no longer affiliated with IANR's School of Natural Resources, Irmak told the board, noting the center will have much to contribute to the global goals of the Daugherty Institute and will in turn reap many benefits from its new association with the institute.

It is also possible that the institute and water center may share some staff support and there have been discussions about adding staff that would support both entities, he said.

Both the Daugherty Institute and the Water Center will be among the first residents of Innovation Campus, now being constructed at the former state fairgrounds north of UNL's main campus, he noted.

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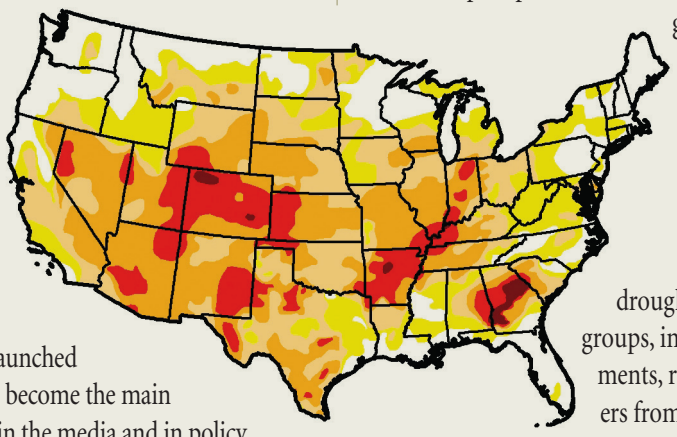
UNL's National Drought Mitigation Center

By Kelly Helm-Smith, UNL School of Natural Resources

The National Drought Mitigation Center, based in the School of Natural Resources at the University of Nebraska–Lincoln, was established in 1995 to help reduce vulnerability to drought. The Drought Center works with states and tribal governments across the United States and with national governments around the world to develop to develop better drought risk management strategies related to monitoring, early warning, and planning. The Center also maintains an extensive website with resources for monitoring, assessing impacts, planning, and K-12 education [http://drought.unl.edu].

Monitoring Drought

The Drought Center is home to the U.S. Drought Monitor, a weekly map that shows where and how badly drought is affecting the country. The Drought Monitor is produced in partnership with the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration, and about 350 expert observers around the country. Drought Monitor authors synthesize data from many different indicators as well as condition reports from around the country each week to produce the map. Since it was first launched in 1999, the U.S. Drought Monitor has become the main focal point for discussions of drought in the media and in policy making circles. Drought relief for agricultural producers is now based in part on what the Drought Monitor says, and some states use it to trigger responses to drought. Many other countries have expressed interest in developing a state-of-the-art system similar to the Drought Monitor, and the Drought Center advises them not to overlook the critical role of the community of drought observers that provide data, impacts and commentary to the authors each week.



U.S. Drought Monitor: http://droughtmonitor.unl.edu

The Drought Center has also developed the Vegetation Drought Response Index (VegDRI), which incorporates remote sensing, climatic, and biophysical data into a map showing drought's effects on vegetation.

VegDRI: http://vegdri.unl.edu

The Daily Gridded Standardized Precipitation Index, developed by the Drought Center and High Plains Regional Climate Center, is calculated at the station level and updated daily.

Daily Gridded SPI: http://www.hprcc.unl.edu/maps/current/index.php?action=update_product&product=SPIData

Monitoring Drought Impacts

The Drought Center launched the Drought Impact Reporter in 2005 as the nation's first comprehensive archive of drought impacts. The web-based tool maps impacts culled from media reports, government agencies, and volunteer observers. In addition to agricultural impacts, the Drought Impact Reporter tracks impacts on energy, tourism and other business, health, the environment, water supply and quality, and fire, and also tracks policy responses, from local burn bans and water restrictions to widespread governmental drought disaster declarations. A recent partnership with the CoCoRaHS volunteer precipitation observing network has yielded an influx of ground-level impact reports.

Drought Impact Reporter: http://droughtreporter.unl.edu

Planning

The Drought Center has published drought planning guides for different groups, including state and national governments, ranchers, and communities. Researchers from the center have consulted all over the world on drought planning. They advocate a risk management approach — knowing how drought affects each major sector, identifying particularly vulnerable sectors or groups, and determining how to reduce impacts. Another key component is establishing monitoring and reporting, so that decision-makers will have as much early warning as possible when drought emerges.

Managing Drought Risk on the Ranch: http://drought.unl.edu/ranchplan
Drought Ready Communities: http://www.drought.unl.edu/Planning/PlanningProcesses/DroughtReadyCommunities.aspx
Drought Planning Resources by State: http://www.drought.unl.edu/Planning/PlanningInfobyState.aspx

Education

In addition to a "Drought for Kids" section on the website, the Drought Center has over the years increased the number of drought-related activities that it offers to groups. Favorites include the "Water

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UNESCO-IHE Students Make First Visit to University of Nebraska

By Steve Ress

Eighteen students and two faculty members from UNESCO-IHE Institute for Water Education in Delft, the Netherlands made their first visit to the University of Nebraska–Lincoln in May. The first of what organizers here are hoping will be many more exchanges between the two institutions.

"Wonderful students and a tremendously successful visit," is how co-organizer Ed Harvey of UNL's School of Natural Resources termed the visit, that coincided with the University of Nebraska's Robert B. Daugherty Water for Food Institute's 2012 global Water for Food Conference at Lincoln's Cornhusker Hotel.

The land and water development master's students were in Nebraska for the first time to complete a field methods course that is being offered as part of a joint UNESCO-IHE/NU partnership through the Daugherty Institute and UNL's Office of Research and Economic Development.

The course in Nebraska was jointly set-up and taught by Harvey and UNL Department of Biological Systems Engineering hydrologic and irrigation engineer Dean Eisenhauer.

This was a two-week field course. In addition to spending a day at the global Water for Food Conference in Lincoln, students completed nine laboratory exercises in water and irrigation engineering in the first week at Eisenhauer's laboratory at UNL's Chase Hall, area farms, and other locations, as well as at UNL's Agricultural Research and Development Center near Mead.

The second week they visited irrigated farms, toured irrigation manufacturing and supply industries and toured irrigation projects including Lake McConaughy and the canal system of the Central Nebraska Public Power and Irrigation District. They also had time for a visit to UNL's Memorial Stadium.

"We hope this is the first of many visits to Nebraska by IHE students," Harvey said.

The visiting students were Andri Tri Atmojo, Ujang Wisnu Barata, Andi Nur Cahyo and Evi Damayanti, Maruddin Fernandus Marpaung, Dadang Nurdin, Aries Purwanto Trisia, Ranti Fani, Wahidah Wahyu Romadhoni, Rahmat Ruznier and Rini Yuniati, all of Indonesia; Solomon Sebesbew Ewnetu and Kbrom Ambachew Gebrehiwot, Birhanu Kindishih Hishe, all of Ethopia; Solome Haile Hagos, Eritria; Alexander Jose Daune Schmidt, Germany; and Santiago Urrestarazu Vincent, Uruguay.

Visiting faculty accompanying the students from UNESCO-IHE were Laszlo Hayde and Sur Suryadi.

The UNESCO-IHE Institute for Water Education is an international institute for water education created in 2003 from the former IHE. It is funded jointly by UNESCO and the Government of the Netherlands.

Alumni tracer surveys show that about 94 percent of UNESCO-IHE's graduate students return to work on water development, policy and implementation projects in their home countries, Harvey said.

Visiting UNESCO-IHE graduate students work in Dean Eisenhauer's irrigation laboratory at UNL's Chase Hall. The students were here in late May and early June as the first of what organizers hope to be additional student exchanges.

Jeff Buettner (center) helped UNESCO-IHE graduate students tour irrigation infrastructure of the expansive Central Nebraska Public Power and Irrigation District in late May.

Schild Puts Priority on Conserving Water In Home Landscapes

By David Ostdiek, UNL Panhandle Research and Extension Center

Landscape water conservation is a major focus for University of Nebraska–Lincoln Extension Educator Jim Schild, at the Scotts Bluff County office of UNL's Panhandle Research and Extension Center.

Geography makes water conservation a priority in Nebraska's semi-arid Panhandle, which receives an average of 15 to 17 inches of precipitation yearly, about half that of Lincoln. So homeowners can potentially use a lot of water just to keep their surroundings green.

Lawns, gardens and other landscaping account for a significant portion of domestic water consumption in western Nebraska. Public water systems must have enough capacity to meet summer demand that is three to four times higher than winter water use, according to Schild.

Jim Schild in one of the buffalograss turf areas at the Panhandle Research and Extension Center.

Schild's program to educate about and promote landscape water conservation has several main focus areas:

First is reducing outside water use at the Panhandle Center. One way of doing this is planting buffalo grass to replace bluegrass. The native turf has been planted in three sites at the center so far, and Schild said he hopes to convert other areas.

He teamed with Extension turfgrass specialist Roch Gaussoin, head of UNL's Department of Agronomy and Horticulture to write or update a pair of Extension publications on buffalo grass (*Establishing Buffalo grass Turf in Nebraska, G1946,* and *Management of Buffalo grass Turf in Nebraska, G1947*). He also worked with the North Platte Natural Resources District at Scottsbluff and City of Gering to establish buffalo grass rebate programs and educate homeowners on caring for buffalo grass.

In sites around the Panhandle Center where turf isn't really needed, trees, shrubs and mulch beds or perennial beds have been planted. These can be watered with drip irrigation to reduce total water use. Center landscaping also features many native plants, such as mountain mahogany, skunk bush sumac, gambel oak, and rabbit brush.

Jim Schild and Amy Seiler, Nebraska Forest Service Community Forestry Specialist, plant a viburnum as part of a trial on the grounds of the Panhandle Research and Extension Center.

Walking tours during the Panhandle Center's annual field day/open house event give the public a chance to see these landscape concepts in practice.

Grounds around the center are the site of the D.A. Murphy Panhandle Arboretum, and another public outreach tool is a brochure published by the Panhandle Center's Arboretum Committee. It describes plantings on the grounds and features a map for self-guided walking tours.

Another focus for Schild is conducting a turf trial at Gering Cemetery in cooperation with Gaussoin and graduate student Scott Dworak. The trial compares the response of 34 different varieties, blends and mixtures

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Is Your Water Affecting Herbicide Performance?

By Tom Dorn, UNL Extension Educator

Herbicide spray mixes are more than 95 percent water and can vary widely in many characteristics.

Purdue University researchers (Gurinderbir Chahal and others) stressed the importance of good water quality when mixing herbicides. They said the properties of water for carrier in spray solutions can greatly influence the performance of herbicides including glyphosate, Ignite, Clarity, 2,4-D, Sharpen, Pursuit, Poast, and many others.

Unlike pure water, quality of groundwater is determined by factors such as pH, hardness, alkalinity, turbidity, and temperature. The presence of dissolved cations like calcium, magnesium, iron, aluminum, zinc, manganese, sodium, potassium, cesium, and lithium can influence herbicide efficacy.

The presence of calcium and magnesium carbonate makes water hard, whereas carbonate and bicarbonate concentration determine the alkalinity of the water.

Herbicides can exist in a neutral form or an ionized form depending on the water pH. The pH (acidity or alkalinity) of the water is a major factor that can affect the efficacy of herbicides.

Herbicides such as Glyphosate, 2,4-D, dicamba, and others are acidic and will remain neutral in water less than 7.0 pH, but will become negatively charged in alkaline water higher than 7.0 pH. The result is the inability to get through the cuticle of weed leaves. On the other hand, herbicides that are basic will react similarly in more acidic water (below 7.0 pH) and will become less effective as the spray becomes more acidic. These include ALS herbicides, like Accent and others.

The Purdue weed specialists report extreme pH levels (below 5.0 pH or above 8.0 pH) not only affect the performance of the herbicide, but also impact its residual in the soil.

Extreme pH levels will also reduce the solubility of the herbicide and can leave residues in your tank that will clog screens and nozzles. These deposits can react with the next herbicide you put in the tank and may reduce its effectiveness.

If you have water that has an adverse pH, there are pH adjusters that allow you to create the optimum chemistry for your herbicide. But before you use a buffer, consider whether the herbicide already has a pH adjuster included in the product.

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Water Cap and Trade A Problem Solver for U.S. Rivers?

Lake Mead, on the Colorado River, is the largest reservoir in the United States, but users are consuming more water than flows down the river in an average year, which threatens the water supply for agriculture and households. To solve this imbalance scientists are proposing a Cap and Trade system of interstate water trading. The proposal, published in *Journal of the American Water Resources Association* (JAWRA), builds on the success of such an initiative in Australia.

The research was inspired by a first-year university assignment by Noelani (Olenka) Forde, who was studying at Quest University Canada. Two years later Forde's assignment has led to the newly published research paper, co-authored with her then Professor Rich Wildman, now a postdoctoral researcher and an environmental fellow at the Harvard University Center for the Environment.

The paper evaluates policy regarding the management of the Colorado River Basin and explores the viability of interstate water trading as a way to add flexibility into the system during times of water shortage.

Forde and Wildman examined Australia's successful Murray-Darling Basin interstate water trading system, to demonstrate the concept's viability for the U.S. The paper explores what features of the Colorado River Basin law and culture might act as barriers to creating a system similar to that in Australia.

The U.S. Bureau of Reclamation is currently seeking to present policymakers with options for restoring the Colorado's imbalance. Forde and Wildman's paper has been published in response to the Bureau's solicitation for comments and ideas from the public for how to solve the problem.

Forde's original first-year assignment calculated the water balance of Lake Mead and asked what should be done if the users of the Colorado River face the prospect of running out of water in the next two decades.

"Olenka proposed a Cap and Trade system such as that being applied to CO2 emissions," said Wildman. "I had never heard of anything like this proposed for the Colorado River Basin, so I suggested we write a paper to share it with a broader audience."

(Study published in the *Journal of the American Water Resources Association).*

Operations of the Central Nebraska Public Power and Irrigation District

By Jeff Buettner, Central Nebraska Public Power and Irrigation District

"What happens to the land, the soil, the water and the minerals within the earth determines what happens to its people. It is upon these resources that men and nations must build. These are the foundations upon which our hopes and dreams for a future of prosperity and security are based." – *George E. Johnson, chief engineer and general manager of the Central Nebraska Public Power and Irrigation District, 1933-59.*

While spoken many years ago, Johnson's words remain as relevant today as ever, perhaps more so given the growing demands on our natural resources. Johnson presided over the formative days of the District and was known for his foresight and propensity for innovation. Today, the District (or Central) continues to adapt and innovate to meet the challenges of managing the precious water resources to which it has been entrusted.

Kingsley Dam (center) separates Lake McConaughy at the top of the photo from Lake Ogallala at the bottom (CNPPID photo).

Central's project begins with its main storage reservoir, Lake McConaughy. Formed by Kingsley Dam across the North Platte River near Ogallala, Lake McConaughy is Nebraska's largest reservoir with a storage capacity of 1.74 million acre-feet.

Water released from Lake McConaughy flows through Lake Ogallala to the Nebraska Public Power District's (NPPD) Keystone Diversion Dam where it can be diverted into NPPD's supply canal or passed down the North Platte River. Once in NPPD's system, the water is used for cooling purposes at the Gerald Gentleman power plant and to generate electricity at the North Platte Hydroplant. The water is then returned to the South Platte River just above Central's Diversion Dam and below the confluence of the North and South Platte Rivers.

The Diversion Dam diverts water into the Supply Canal for conveyance to Central's three main irrigation canals, E65, E67 and Phelps, which serve more than 104,000 acres in Gosper, Phelps and Kearney counties. Another 6,500 acres in Lincoln and Dawson counties receive irrigation service directly from the Supply Canal.

Elwood Reservoir, which was added to the system in 1976 as part of a major rehabilitation project, provides supplemental storage water to the E65 canal system. Water transferred from Lake McConaughy is pumped into the reservoir in the spring and released during the irrigation season.

The system also provides documented ground water recharge benefits to more than 310,000 acres in and adjacent to the project area. Central holds two incidental underground storage rights issued by the state in recognition of the recharge benefits. In addition, water stored in Lake McConaughy is available to several other irrigation canals serving land between Kingsley Dam and Kearney.

As water travels through the Supply Canal, it generates power at three hydroplants: Jeffrey and Johnson No. 1, each with the capacity to generate 20,000 kilowatts (kW) of electricity; and Johnson No. 2 (23,000 kW). The three hydroplants are unmanned and remotely operated from the Gothenburg Control Center. With the addition of the 50,000-kilowatt Kingsley Hydro in 1984, also operated from Gothenburg, Central can generate up to 113,000 kilowatts of electricity, enough power to meet the residential needs of a city of 90,000 people. All power is sold to NPPD for distribution to customers.

Central's project also provides a wide variety of recreational opportunities and habitat for wildlife. The Nebraska Game and Parks Commission manages recreation areas at Lake McConaughy and at several other lakes along Central's Supply Canal.

Conjunctive Use

Central completed rehabilitation projects on its canal system in the 1980s. An important aspect of the projects was the attention given to designing, incorporating and improving the "conjunctive use" aspect of Central's system.

During the planning stages for the rehabilitation projects, computer groundwater modeling studies of the system resulted in a design that provides recharge where groundwater development is heavy and

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Advisory Board continued from page 4

A search is also underway to name a new permanent Water Center director, with Irmak saying a review of applicants was to begin in late June. Search committee members include Alan Kolok, Lilyan Fulginiti, Tom Franti, Shannon Bartelt-Hunt, John Gates, all of UNL, and Mark Brohman of the Nebraska Environmental Trust.

Shifting discussion to the center's Water Sciences Laboratory (WSL), director of laboratory services Dan Snow noted that funding for University core facilities is becoming increasingly competitive, with the WSL currently receiving about two-thirds of its funding from Nebraska Research Initiative (NRI) funds. The lab is continuing to seek-out funding from a variety of other sources, Snow said.

Lab fees help in operation and maintenance of the WSL, but alone cannot make the facility self-sufficient. WSL currently helps support research needs for up to 70 faculty members, as well as supporting undergraduate, graduate and doctoral students and post-docs.

Board members discussed what could be done to help the WSL in seeking-out new funding sources, gaining additional faculty support and improving efficiencies and volume.

One of the prime functions of the WSL is developing new methodologies for finding minute traces of substances in water, particularly trace organics, and both Irmak and Snow said that this mission will not reduced due to funding concerns.

Water Center assistant director Lorrie Benson briefed the board on the July water and natural resources tour to view flood damage and repairs and lessons learned from the 2011 Missouri River flood and previewed the Nov. 13 "Water: Science, Practice and Policy Symposium" and Nov. 14 water law conference, both to be held at Lincoln's Cornhusker Hotel.

Food Security continued from page 1

a meeting between Milliken and FAO Director General Jose Graziano da Silva, and a seminar on water and food security presented by Milliken and Roberto Lenton, founding executive director of the Daugherty Institute.

"The University of Nebraska and the Food and Agriculture Organization have worked together many times in the past and I could not be more pleased that we are taking our partnership to the next level," Milliken said. "FAO's network and influence at the international level is unrivaled and the opportunity to tap into these resources will be highly beneficial for the University and Nebraska. In return, the work of the Daugherty Institute will support in a unique way FAO's critical efforts to sustainably meet the nutritional needs of a growing population."

The partnership between the Daugherty Institute and FAO will focus on areas including:

Sustainably increasing crop yields and water productivity using mapping, modeling and information systems such as the Global Yield Gap Atlas, NU's initiative to provide estimates of the gap between current average farm yields and the potential yield ceiling for major food crops; and AQUASTAT, FAO's global information system on water and agriculture.

Improving drought management and climate adaptation through drought monitoring programs, development of risk-based drought preparedness strategies and policies, and stronger drought warning systems to better cope with water scarcity in a changing climate.

Improving sustainable production under drought, stress and water-limited conditions through plant breeding, agronomic practices, crop physiology, biotechnology and molecular biology – and, ultimately, through effective dissemination of new knowledge for application by farmers and others.

Initial activities will include regular information exchanges, joint research projects and joint workshops, conferences and symposia which will complement FAO's frequent global meetings on water, food and agriculture and NU's annual Water for Food Conference. The university and FAO will develop annual work plans that outline more specific activities.

"FAO attaches high value to the Memorandum of Understanding with the University of Nebraska's Water for Food Institute," said Pasquale Steduto, deputy director of FAO's land and water division and a plenary speaker at NU's 2011 Water for Food Conference. "We share the same basic goals and we carry out complementary work in critical areas of mutual interest – including, among others, increasing the productivity of water under water-scarcity conditions."

FAO works to achieve global food security so that people have access to enough high-quality food to lead active, healthy lives. In both developed and developing countries, FAO helps to raise levels of nutrition, improve agricultural productivity, improve the quality of life in rural populations, and contribute to global economic growth.

The Daugherty Institute was established in 2010 with a $50 million founding gift from the Robert B. Daugherty Charitable Foundation. It is a research, education and policy institute that aims to help the world use its limited freshwater resources effectively to ensure sustainable food security for current and future generations.

From the Director *continued from page 2*

your attention to the dry bean research being done by Carlos Urrea at Scottsbluff, the water/herbicide connections by Tom Dorn and the landscape water conservation work being done by Jim Schild at Scotts Bluff County.

Additionally, there are articles on two more of our longtime collaborators, the National Drought Mitigation Center here at UNL and the Central Nebraska Public Power and Irrigation District in Holdrege.

You will also find a short report on our June meeting with members of the Nebraska Water Center's advisory board.

Also, please take a few minutes to respond to our annual reader survey. Your comments on this help us evaluate and bring about changes to what appears in this publication.

One particularly sad piece of news this summer was the death of my longtime friend and colleague, C. Dean Yonts, an irrigation engineer in UNL's Department of Biological Systems Engineering at UNL's Panhandle Research and Extension Center at Scottsbluff. In a long and productive career at UNL, Dean was well known and respected, not only in our academic circles, but also more importantly by irrigators and producers in Nebraska's panhandle and in eastern Wyoming, which Dean loved so much. We deeply regret his passing and send our condolences to Dean's family.

I also want to call your attention to the livestock producers in north central Nebraska that have been hit so hard this summer by both drought and fire. This is a disaster of major proportions.

The fire, in particular, has consumed hundreds of miles of permanent fence, along with what little summer grass was left for several thousand cows and calves.

The North Central Development Center in Ainsworth has set up a fund to take monetary donations to help with the cost of the fire. Donations may be made online through PayPal; at https://www.paypal.com/cgi-bin/webscr?cmd=_s-xclick&hosted_button_id=ZCSJMPUDX9VUN

In closing, my first seven months as interim director of the Nebraska Water Center have been very gratifying in becoming part of the longstanding traditions of the water center in serving it's traditional state and regional clientele and colleagues, as well as meshing so well with the global focus of the Robert B. Daugherty Water for Food Institute.

Fall Events *continued from page 1*

projects and research in Nebraska going forward. Panelists are W. Don Nelson, Chris Langemeier, and Dayle Williamson.

Rounding out the morning will be Richard Cruse, Iowa State University, presenting a new report on "Assessing the Health of Streams in Agricultural Landscapes: The Impacts of Land Management Change on Water Quality," and Jesse Bradley, Nebraska Department of Natural Resources (DNR), outlining the state's new approach to evaluating fully appropriated basins in Nebraska.

"An extended noon hour will feature the popular combined poster session and 'roaming' lunch," according to Benson. "This opportunity to view posters and visit with other attendees while enjoying a wide selection of finger foods has been a hit with conference goers, so it's back."

The afternoon breakout sessions will feature more details on water-related research, programming and policy. Sessions include more details on DNR's new integrated management approach, along with a wide range of other topics.

The Water Law Conference will begin with "Hydrology 101" by UNL geoscientist Jesse Korus and then move to "Water Rights Transfers: Private Sales and NRD Transfers" by Daniel Lindstrom of Jacobsen, Orr, Lindstrom and Holbrook, P.C., LLO. Later in the morning, David Bargen with Rembolt Ludtke LLP will present "Governmental Liability For Water In The Wrong Place: Lessons From The Columbus Sewer Back-up Case," followed by Anthony Schutz of NU's College of Law reviewing what's new in water law on the national scene that could impact Nebraska.

Among the afternoon's sessions is one on administrative practice before the Nebraska Departments of Natural Resources and Environmental Quality by LeRoy Sievers and Annette Kovar of those respective departments and "Alternative Dispute Resolution in Water Disputes" by Stephen Moss of Mattson, Ricketts, Davies, Stewart and Calkins.

Marcus Powers, a lawyer as well as co-owner and head brewer for Zipline Brewing Company, will present "Turning Water into Beer: The Impact of Federal, State and Local Laws on Craft Breweries." Sandy Zellmer of NU's College of Law will address 40 years of Supreme Court jurisprudence on the U.S. Clean Water Act and Tom Wilmoth of Blankenau Wilmoth LLP will discuss ethics in water law practice.

Continuing legal education credit applications are pending for Nebraska, Iowa and Colorado. More information about both events, including detailed agendas and online registration, is at watercenter.unl.edu. Registration for one day is $155 and $270 for both days. Additional questions can be directed to Benson at 402-472-7372 or lbenson2@unl.edu.

2012 Water & Natural Resources Tour of Flooding and Lessons Learned From the 2011 Missouri River Flood

John Miyoshi, manager of the Lower Platte North NRD, talks about the district's recently opened Lake Wanahoo project near Wahoo.

Rick Wilson of the USGS Nebraska Water Science Center and Kirk Harvey of the Nebraska Department of Roads talk about flood waters, sediment deposits and bridge construction work resulting from the flood in the Decatur area.

Stan Staab, manager of the Lower Elkhorn NRD and Nebraska Water Center assistant director Lorrie Benson talk at Kimmel Orchard near Nebraska City.

A windmill at UNL's Kimmel Education and Research Center in Nebraska City was made by the Kregel Windmill Co., whose offices and shops are now a period museum in Nebraska City.

Stan Staab (center) manager of the Lower Elkhorn NRD in Norfolk, talks about how the Logan East Rural Water System responded to the flood and restored water service to residents of the Harbor 671 are on the Missouri River near Tekamah.

Tour host Mike Jess looks at a geologic outcropping on the Steamboat Trace Trail near Peru.

A boat marina at Haworth Park, near Bellevue, still bore unmistakable signs of last summer's flooding.

Tour participants look at lingering flood damage and erosion to fields at Lee Valley Farms near Tekamah.

The tour stopped at Nebraska City's Omaha Public Power District power generation plant to hear how OPPD kept the plant in operation throughout last summer's record flooding of the Missouri River.

At north Omaha's N.P. Dodge Park, Graham Herbst of the Nebraska Forest Service discusses how the flood killed and damaged trees all along the path of the floodwaters.

Martin Cleveland (with microphone) and Marlin Petermann of the Papio-Missouri NRD talk about flood damage and the need to patrol levees in the area south of Bellevue during last summer's flood.

(photos by Steve Ress)

A lone bulldozer pushes sand deposited by last summer's Missouri River floodwaters on fields near the river close to Tekamah.

Retired UNL Professor Bob Diffendal talks about the significance of the geologic outcroppings visible along the Steamboat Trace Trail near Peru.

No One-size-fits-all Solutions to Water, Food Security

By Dan Moser, IANR News

Examples of how water use can be managed successfully to feed a growing world population can be found in locations as diverse as Nebraska and India, but there's no one-size-fits-all solution to the challenges ahead, said the director of the Robert B. Daugherty Water for Food Institute (WFI) at the University of Nebraska at May's fourth annual global Water for Food Conference.

Several conference speakers pointed out that changing what people eat will be a key component of solving the looming crisis.

Roberto Lenton, who became executive director of WFI in February, opened the conference, which drew more than 530 people from 26 nations to discuss the research, education and policy implications of feeding a world whose population is expected to grow from 7 billion to 9 billion by 2050, while using less water for agriculture.

Colin Chartres, director general of the Sri Lanka-based International Water Management Institute, defined the stark challenge this way: Based on current trends, by 2030 the world will need double the water it requires now. "How we deal with water scarcity over the next 10 to 20 years will have a fundamental impact on food security, poverty reduction and the environment in years to come," Chartres said.

Lenton stressed that while the challenges are global, the solutions must be devised locally because of differences in water availability and technological and policy options. Lenton cited Nebraska and India as examples. Nebraska, which leads the U.S. in irrigated acreage, will celebrate this year the 40th anniversary of creation of its unique natural resource district system that puts groundwater management in the hands of local units of government with locally elected boards and taxing authority.

"This was a landmark event," Lenton said, adding that even as irrigation has continued to increase, NRD management, as well as a UNL-created water management network, have helped the water table remain relatively stable.

In a region of India, meantime, it was urban dwellers' concern about water sanitation that drove changes in watershed management upstream and, ultimately, encouraged those upstream villages to come up with a system to divide water equitably and protect the watershed.

Lenton said water management means different things to different people, ranging from a household to a global perspective. For

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Collaboration Key to Water, Food Solutions

By Dan Moser, IANR News

From the boardrooms and research plots of agribusiness companies and the halls of governments to the tiny farms of the developing world, collaboration is key to making progress toward the goal of feeding a world with a growing population and limited water. "

Some people describe this as a crisis," said Jeff Raikes, chief executive officer of the Bill & Melinda Gates Foundation, at the global Water for Food Conference, that was held at Lincoln's Cornhusker Hotel May 30 to June 1. But it's also "an opportunity to come together and really work in new ways that will produce … new approaches" to create more sustainable agriculture that uses less water.

Raikes spoke during the second day of the conference, hosted by the Robert B. Daugherty Foundation at the University of Nebraska and the Gates Foundation. Attendees discussed the research, education and policy implications of feeding a world whose population is expected to grow from 7 billion to 9 billion by 2050, while using less water for agriculture.

Representatives of some of the world's leading agribusinesses discussed how private industry, working with governments and producers, is helping address the challenges. The panel was presented by Global Harvest Initiative.

These businesses are moving beyond their traditional purviews – selling seed or agricultural equipment, for example – to broader, systems-based approaches that aim to help even the smallest producers become better managers of their limited land, water and other resources. Natalie DiNicola, vice president of sustainable ag partnerships for Monsanto, pointed to the recent G-8 summit, where 45 companies, half from Africa, signed an agreement with several governments to make substantial investments in improving agricultural production in sub-Saharan Africa, where the looming food shortage is most acute.

DiNicola said the tone at the summit was encouraging, a significant shift from past finger-pointing about the problem toward a focus on solutions and how both public and private entities have roles to play.

Graeme Jarvis, director of John Deere's Latin American Technology Innovation Center, said his company now is about more

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Longtime UNL Irrigation Management Specialist Dies at 61

C. Dean Yonts, longtime irrigation engineer at the University of Nebraska–Lincoln's Panhandle Research and Extension Center at Scottsbluff, passed away July 6 after an extended illness. He was 61.

Memorial services were July 12 at the First Presbyterian Church, Scottsbluff.

A memorial fund has been established to Brent's Place, an organization that provides patient assistance in Denver, Colo., in care of the family or to a charity of your choice.

Yonts was born in 1951 to homesteaders Harold and Eva Yonts. They were homesteaders in the Whistle Creek area 15 miles southeast of Powell, Wyo. Yonts attended school in Byron, Wyo., graduating in 1969, then attending and graduating from Northwest College in Powell in 1971.

Longtime UNL irrigation engineer Dean Yonts (left) talks with then IANR Vice Chancellor John Owens and fellow UNL irrigation engineer Suat Irmak at Husker Harvest Days in 2008. Yonts passed away in early July (Steve Ress photo).

He then went to the University of Wyoming where he earned Bachelor's and Master's degrees in Agricultural Engineering.

C. Dean Yonts

In 1975 he married Kathryn "Kathy" Ann Books in Kemmerer, Wyo. The couple moved to Nebraska and resided in Scottsbluff ever since. They are parents to two children, Travis and Marissa.

Most of Yonts career at UNL has been in irrigation water management as an Associate Professor in UNL's Department of Biological Systems Engineering at UNL Extension's Panhandle Research and Extension Center in Scottsbluff.

He was also involved in many youth activities. He coached soccer, softball and baseball, helped with Boy Scouts and Girl Scouts and taught Sunday school at the First Presbyterian Church in Scottsbluff.

Survivors include his wife Kathy and daughter Marissa, both of Scottsbluff, and his son Travis of Omaha. He is also survived by his brother Robert and wife Barb of Casper, Wyo., brother Delmer and wife Peggy of Grant-Valkaria, Fla., brother Larry of Powell, Wyo., sister Linda Pangburn and husband Gary of Greybull, Wyo., and numerous nieces and nephews.

(Editor's Note: information taken in part from the Scottsbluff Star-Herald)

Dry Bean Research continued from page 4

root rot, and bean common mosaic virus). Germplasm also has been released that can be used for different bean breeding programs in the United States. And Urrea said there will be more lines to come in different market classes: great northern, pintos, and small reds.

Perhaps some of those lines have the potential to be released to the public as cultivars. But before that is known, Urrea said, new lines would need to be tested on a larger scale, in growers' fields.

In addition to heat and drought tolerance and resistance to several diseases, Urrea said these new lines also would need several other desirable traits: an upright plant architecture to facilitate direct combine harvest; high seed quality; and maturity traits that would fit growing conditions in western Nebraska.

Urrea visited the bean-breeding site at Puerto Rico early in 2012 and is impressed with the lines selected this year.

Another goal of this project is to find and mark the genes responsible for drought tolerance. Urrea said he and his colleagues have developed a mapping population of dry beans between tropical and temperate lines that was tested last year and will be tested again this year at both locations. This project is in collaboration with the U.S. Department of Agriculture at Prosser, Wash., (Phil Miklas), USDA-TARS at Mayaguez, PR (Tim Porch) and North Dakota State University (Juan Osorno and Angela Linares).

Urrea recently attended an Association Mapping Workshop at North Dakota State University hosted by the BeanCAP. He was learning how to employ molecular markers (single-nucleotide polymorphisms, or SNPs in scientific terminology) generated by the BeanCAP to uncover genomic regions associated with drought tolerance. About 10,000 SNPs have been developed by the BeanCAP.

The sources for this mapping population included dry bean lines from the CIAT Center for Tropical Agriculture and from National Dry Bean Breeding Program in Mexico, Urrea said. He said the source of drought tolerance that he is using for mapping was identified through testing on terminal drought (when irrigation is stopped at the flowering stage of plant development). Nature has cooperated in this effort; in each of the past several years. After the irrigation was stopped, precipitation also was scarce, with less than 1 inch of rain between blossom stage and harvest each year. Those conditions make life difficult for dry bean producers, but are favorable for Urrea's research.

Using dry bean lines from the Center for Tropical Agriculture not only helps with the drought tolerance project, but also has other benefits to the breeding program, Urrea said. Every year, he introduces new lines coming from CIAT, some from specific crosses between different common bean (*Phaseolus vulgaris*) species like tepary and scarlet runner beans. In doing so, he has been able to identify some lines that are well adapted to western Nebraska's conditions and drought, and started intergressing those into his dry bean breeding program through hybridization.

The goal is to develop dry edible beans that will use water more efficiently, and perhaps use less water.

One potential benefit: if bean producers don't need as much water to raise their bean crop, they might be able to use some of the available supply for other crops on their farms, Urrea said.

Urrea and other U.S. bean breeders also are looking at how drought affects the nutritional composition of dry beans. About 96 accessions from different centers of origin and domestication were screened in 2012 under drought and non-drought stress plots. This research is part of BeanCAP (Coordinated Agricultural Programs) efforts and includes several other states, including Michigan, North Dakota, Washington and Idaho.

NDMC continued from page 5

Banking" and "Meteoropoly," games that the center devised, as well as activities involving tree rings, sponges, and water. They can be calibrated for age and circumstance (such as whether or not it's OK to make a little splash). The Drought Center is also a partner in a community education program for adults, Climate Masters, which teaches people simple ways to reduce their carbon emissions.

Staff

Donald A. Wilhite founded the center in 1995 and led it until 2007, when he became director of the School of Natural Resources. Michael J. Hayes, a climatologist who has been with the center from the beginning, has been the director since 2007. Since 2007, the Drought Center's research activities have been organized into three Program Areas: a Monitoring Program Area led by Mark Svoboda, a Planning and Social Science Program Area led by Cody Knutson, and a GIScience Program Area led by Brian Wardlow, who has recently moved to a position within the School of Natural Resources. The expertise of the16 faculty and staff members at the National Drought Mitigation Center includes climatology, geography, geological engineering, anthropology, rural sociology, human dimensions, history, community and regional planning, community development, environmental education, journalism, GIS and remote sensing, and information technology.

Conserving Water *continued from page 7*

of turf grasses to deficit irrigation. Strips receive variable amounts of irrigation, ranging from none to 100 percent of evapo-transpiration (ET) requirements. Each strip is evaluated on color, stand density and recovery. This is the fourth year of the trial, conducted in conjunction with the City of Gering and its Parks and Cemetery Departments.

A third area where Schild concentrates his efforts is conducting public workshops on "Making Every Drop Count" around the home, teaming up with Annie Folck, City of Scottsbluff Storm Water Coordinator, and Amy Seiler, Nebraska Forest Service Community Forestry Specialist.

Schild's part of this effort is working with homeowners to help them conduct lawn irrigation water audits to determine where water inefficiencies exist. Seiler speaks about sustainable landscapes, mulching tree beds, using zone irrigation, and grouping plants in zones according to similar water needs. Folck talks about implementing rain gardens and utilizing rainwater runoff in the landscape instead of diverting it into the city's stormwater drains.

Schild also coordinates UNL Extension's Master Gardener Program in Scotts Bluff County. In recent years, conserving water in the landscape has been a focus of the series of educational programs presented to master gardener volunteers. The same theme is emphasized in a series of 30-second radio public service announcements (PSAs) that some of the Master Gardener volunteers write and record and which then are sent to radio stations throughout the Panhandle area.

Herbicide Performance *continued from page 8*

Ammonium sulfate(AMS) is nearly always recommended as a water treatment prior to adding glyphosate to the tank. AMS binds with the cations of other metals, especially calcium, magnesium, and iron that would otherwise tie up some of the glyphosate in the spray tank. AMS is also said to increase the absorption of the herbicide into the leaf tissue.

Other herbicides such as Select Max, Poast, and growth regulators like 2,4-D can give a poor performance if your water has a high level of carbonates and bicarbonates. A tank mix with diammonim sulfate could help, but it needs to be the right amount.

Specific additives for various herbicides in corn can be found on page 40, for sorghum, page 41, and soybeans, page 42 of both the 2011 and 2012 editions of UNL Extension's "Guide for Weed Management" (EC-130).

No One-Size-Fits All *continued from page 14*

example, he noted, a farmer focuses on how to maximize yield with the water available to increase profits, while national policymakers consider how to ensure food security for citizens while minimizing water used by agriculture so other needs can be met.

"Most of us in this room generally think of one scale or maybe a couple," Lenton said. "We can't solve a global issue if we can't understand what's happening on other levels." While this is Lenton's first Water for Food Conference, NU President James B. Milliken noted that the WFI already is making important strides. He noted the establishment of several partnerships with both private and governmental entities from around the world and said more are to come. The institute's mission is to educate not just scientists about the challenges, but also policymakers and citizens, beginning with the youngest, those in K-12 schools, Milliken said.

Another speaker, Malin Falkenmark, senior scientific adviser at the Stockholm International Water Institute, said good management of "blue water" and "green water" is critical. Blue water is drawn from aquifers, rivers and lakes and green water falls as precipitation.

By 2050, she warned, 46 percent of the world will live in areas with blue-water shortages. Falkenmark said managing diet expectations is important. Even with projected yield increases, there won't be enough water to support a diet of 3,000 kilocalories a day if 20 percent of those calories come from meat. She said there would be "just enough" for a diet with 5 percent of the calories coming from meat.

That would be a significant shift, not just for people in the developed world but for those in the developing world whose diets tend to include more meat as wealth rises.

In addition to a diet with less meat, Chartres said any solution to feeding more people with less water must include: a reduction in waste, both in production and consumption; encouragement of trade, with water-hungry crops grown in water-rich areas; and increased production. These steps will require political leadership, new policies, regulation enforcement, reform of governments and institutions and more, Chartres added.

The conference was May 30 to June 1 at Lincoln's Cornhusker Hotel. The theme was "Blue Water, Green Water and the Future of Agriculture" and it was hosted by the Daugherty Institute and the Bill & Melinda Gates Foundation.

CNPPID continued from page 9

a lined system, or pipelines where irrigation comes mainly from the surface water system. The result has been a generally stable water table beneath and adjacent to Central's service area.

Central's efforts marked the first time in Nebraska that an irrigation system was designed to address the needs of both surface and groundwater irrigators. Central monitors a system of 147 observation wells throughout the service area, enabling the District to compile the necessary data for continued evaluation of groundwater levels.

A typical pump site for center pivot irrigation in the Central Nebraska Public Power and Irrigation District (CNPPID photo).

Water Rights

Central holds several types of state water rights. Irrigation water rights have been obtained for land served by Central's system. Irrigation water rights for each parcel fall into two categories: natural flow and storage use rights.

Natural flow is diverted from the base flow of the river and is administered by the Nebraska Department of Natural Resources on a "first-in-time, first-in-right" principle. If the natural flow of the river diminishes, junior water rights are shut down so more senior water rights can continue to receive water. Central's earliest water rights were obtained in 1934, but are junior to most others on the Platte River, many of which date to the 19th century. Therefore, Central's diversions for irrigation are primarily storage water released from Lake McConaughy.

Several irrigation projects that depend primarily on natural flow water rights contract with Central for supplemental water; that is, storage water that can be delivered when natural flow in the river is insufficient to meet demand.

Central also holds a permit to divert water for the production of hydroelectric generation at its hydroelectric plants.

The Platte River, from its headwaters in Colorado to its confluence with the Loup River, is fed primarily by snowmelt from the Rocky Mountains. Prior to the construction of Kingsley Dam, the Platte River frequently dried up during the summer months. Storage water at Lake McConaughy has largely prevented "no-flow days" in the Platte over the last 70 years, except during periods of extreme drought.

Lake McConaughy depends on return flows from upstream irrigation projects for most of its water supply. Federal storage reservoirs in Wyoming provide irrigation water to projects in eastern Wyoming and western Nebraska. Some of the water diverted into these canals enters the groundwater table and returns to the North Platte River above Lake McConaughy. Groundwater development and improvements in irrigation efficiencies over the years have reduced return flows to the North Platte River, with a related impact on inflows to Lake McConaughy. According to an engineering study conducted in 2009, average annual inflows to the reservoir have declined by more than 100,000 acre-feet since 1950.

Only rarely – as in 2011 when snowmelt runoff exceeded the storage capacity of upstream reservoirs – does water flow directly from the Wyoming reservoirs to Lake McConaughy.

Supervisory Control and Data Acquisition

Installation of supervisory control capability for Central's irrigation canals started in 1977 and was completed in 1985. Central has continued to modify and improve its supervisory control and data acquisition (SCADA) system since that time.

The SCADA system allows automated control of canal levels by operating check gates. This minimizes the effects of sudden rainstorms or use changes and reduces the adjustments that canal patrolmen must make over the course of a day.

Automated structures have electrically operated gates with position transmitters, upstream and downstream meters that indicate canal elevation above and below the structures, and remote terminal units (RTUs) that link the equipment together.

Managing Resources

Management of water resources is an important part of Central's operations. To manage the system properly, it is imperative that accurate measurements are taken and that thorough records are compiled. Each customer's turnout is fitted with a water meter or is measured. Records of deliveries are kept down to the tenth of an inch.

Central has been active in water conservation efforts for many years and has gone to great lengths to improve the efficiency of its delivery system. Such efforts include a pivot incentive policy that prompted a dramatic increase in the number of pivots served by Central's irrigation system. Today there are 418 pivots taking deliveries from the canal system, covering 51% of Central's irrigated acres, with more to be added in the future.

Other practices include the installation of flow meters on turnouts; operation of automated weather stations to provide evapotranspiration data to producers and agronomists and participation in a web-based network to disseminate the ET data; improvements in the supervisory control system to increase the timeliness of deliveries; creating the position of conservation director to work directly with irrigation customers; and adoption of a delivery service rate structure that encourages irrigation customers to implement conservation practices.

Central also completed an improvement project on the E67 Canal in 2003. The project replaced the canal's open laterals with 18 miles of buried pipeline. The only open canal remaining is the first 2.8 miles, which is lined with a synthetic membrane to prevent conveyance losses.

As a result of efforts to efficiently manage and conserve its available water resources, Central operates one of the most efficient irrigation projects in the western United States.

(Editor's Note: CNPPID is a political subdivision of the State of Nebraska with headquarters in Holdrege. A 12-member board of directors elected from Gosper, Phelps, Kearney, Keith, Lincoln and Dawson counties governs it. Revenues are generated primarily from the production of power and from fees for irrigation delivery service. CNPPID's hydroelectric facilities are licensed by the Federal Energy Regulatory Commission. CNPPID has long partnered with the University of Nebraska–Lincoln on a number of research, education and extension programs).

Conserving Water *continued from page 7*

than putting its familiar green farm equipment in fields. Deere's new FarmSight initiative seeks to integrate technology and equipment in ways that help producers produce higher yields with fewer resources.

One facet of this effort is to gather data and make it easily accessible to farmers in the field so they can make sound management decisions. "A lot of information is going to be generated on the farm … but it'll be captured in a way that's easy to use," Jarvis said.

John Soper, vice president of crop genetics research and development at Pioneer Hi-Bred, acknowledged companies have a profit incentive to invest in the developing world, where today's subsistence farmer could be tomorrow's customer. "It is a business opportunity and that's why we're interested in doing it," Soper said.

But companies like his also are driven as good corporate citizens to help address the challenges. "A lot of people assume large companies don't work with small farmers, and that's simply not true," he said. He noted Pioneer already has millions of customers in India and China and welcomes future growth in Africa. The industry panelists also said the world's governments must establish and enforce free-trade policies and clear, long-term, science-based and business-friendly regulations, particularly protecting companies' intellectual property rights on their products.

Soper said companies base their decisions on where they'll do business in part on the regulatory environment.

Raikes said up to 1.3 billion people in the world live on less than $1 a day, 75 percent of them in rural areas. Addressing their nutritional needs is about more than putting food in bellies. Adequately fed people have a chance to get good educations and better health care and live longer, better lives, he said.

Speaking to reporters at a media briefing, Raikes said he's confident the technologies to improve these people's lives can be created. The great challenge is to prove to small farmers they will work and convince them to adopt the practices and technologies.

Raikes and Simi Kamal, chief executive officer of the Pakistan-based Hisaar Foundation, said it's critical those efforts involve women. Women provide about 70 percent of agricultural labor in sub-Saharan Africa yet are not involved in management decisions, Kamal said at the briefing.

"What we are moving toward is building a very strong women's voice, especially in the decision-making process," Kamal said.

The conference theme was "Blue Water, Green Water and the Future of Agriculture."

Donations for North Central Nebraska Fire Recovery

North Central Nebraska livestock producers have been hit with a one-two punch – drought and now fire. The extremely dry conditions, coupled with a fire that is burning tens of thousands of acres of pastureland, have caused a disaster of major proportions.

The fire has consumed hundreds of miles of permanent fence, along with what little summer grass was left for several thousand cows and calves to feed on. The fences that have been destroyed will have to be rebuilt before grazing can resume next year, if weather conditions permit a good growing season.

The North Central Development Center in Ainsworth has set up a fund to take monetary donations to help with the cost of the fire. Donations may be made online through PayPal; at https://www.paypal.com/cgi-bin/webscr?cmd=_s-xclick&hosted_button_id=ZCSJMPUDX9VUN.

Donations of wire and post may be delivered to the Farmers and Ranchers Co-op in Ainsworth, 224 South Main St. Contact is Rocky Sheehan, plant manager, 402-387-2810.

Individuals who wish to specify their donations to help with fencing materials and hay may send checks to the University of Nebraska-Lincoln Extension office in Ainsworth. The mailing address is BKR Extension office, 148 W. Fourth St., Ainsworth, NE 69210. Donations will be deposited into the NCDC Fire Relief Fund.

For more information contact the UNL extension office in Ainsworth 1-800-634-8951 or e-mail dbauer1@unl.edu. The NCDC can be contacted at 402-387-2740 for more information.

We're Updating!!

We are updating our mailing list. If you have a change of address, title and/or name, or would like to have your name added to or removed from the *Water Current* mailing list, please let us know. Also, if you know of anyone who might be interested in receiving our publications, please give us their names and we will be glad to add them to our mailing list.

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Larkin Powell, Ph.D. *continued from page 1*

involving forest and grassland songbirds, upland game birds, sandhill cranes, quail-doves, waterfowl, small mammals, mesopredators, painted turtles, and raptors.

Education:

Ph.D., Ecology, University of Georgia, Athens, Ga., 1998
M.S., Ecology and Evolutionary Biology, Iowa State University, Ames, Iowa, 1992
B.S., Biology, Graceland University, Lamoni, Iowa, 1990

Examples of Current Research/Extension Programs:

— Effects of Wind-Power Development on Prairie Grouse in Nebraska: research starting in 2013—do wind turbines have effects on prairie-chicken and sharp-tailed grouse movements, survival, and mating behaviors? Funded by NGPC. Three-year field study is near Ainsworth.
— Waterfowl Harvest Information: working with NGPC to assess hunter data base to learn about temporal and spatial distribution of harvest of ducks, with emphasis on how changes in regulations affect the distribution of how many ducks get harvested and where they get harvested.
— Greater Prairie-Chicken Habitat: study coming to an end; funded by NGPC. Study of prairie-chickens on private lands in the eastern Sandhills. What type of nesting and brood-rearing habitats are selected by hens? Information will provide landowners with grazing recommendations if they want to support chicken populations for hunting or ecotourism or pleasure.
— A Study of Issues Faced by Private Landowners in Namibia and the Great Plains: Critical Decisions Made to Support Grasslands—assessing the potential for private nature reserves, with private investment, to support conservation in a sustainable way on the Great Plains. I assessed similar models in Namibia.
— Demographic analysis of fisheries data: Collaborating with UNL fisheries biologists Mark Pegg and Kevin Pope, to provide demographic analyses of mark-recapture and survey data from their labs. They have published papers with the first-ever survival rates and population size estimates for pallid sturgeon in the Missouri River, for example. The collaborations began when their students took Powell's graduate-level course.

Examples of Past Research/Extension Programs:

Assessing Local and Regional Variability in Productivity and Fidelity of Grassland Birds on National Park Service Units in the Great Plains: Using three national park sites to determine if small park units were justified in spending resources to benefit avian species of conservation concern.

Examples of Outreach Programs:

Co-advises the UNL Wildlife Club who provides outreach (environmental education) to hundreds of school-aged kids at various festivals and school programs every year.

Teaching Responsibilities:

Powell teaches a capstone course for the F&W major, Wildlife Management Techniques, each fall. He teaches a required course for the F&W major, Wildlife Ecology and Management, each spring. He also teaches a graduate-level course, Vertebrate Population Analyses—it provides background in estimating survival rates, density, home range size, and population size from data commonly collected from mark-recapture, radio-telemetry and/or wildlife surveys.

Selected Publications:

Henaux, V., L. A. Powell, M. Vrtiska, and K. Hobson. *In press.* Establishing Winter Origins of Migrating Lesser Snow Geese Using Stable Isotopes. Avian Conservation and Ecology.

Matthews, T. W., J. S. Taylor, and L. A. Powell. *In press.* Mid-contract management of CRP grasslands provides benefits for ring-necked pheasant nest and brood survival. Journal of Wildlife Management.

Matthews, T. W., J. S. Taylor, and L. A. Powell. *In press.* Ring-necked pheasant hens select managed CRP grasslands for nesting and brood-rearing. Journal of Wildlife Management.

Gregory, C. J., S. J. Dinsmore, L. A. Powell, and J. G. Jorgensen. *In press.* Estimating the abundance of long-billed curlews in Nebraska. Journal of Field Ornithology.

Barcelo, I., J. C. Guzman-Aranda, F. Chavez-Ramirez, and L. A. Powell. *In press.* Rural inhabitant perceptions of sandhill cranes in wintering areas of northern Mexico. Human Dimensions of Wildlife.

Steffensen, K.D., L. A. Powell, and M. Pegg. *In press.* Population size of hatchery-reared and wild pallid sturgeon in the lower Missouri River. North American Journal of Fisheries Management.

Powell, L. A., M. D. Giovanni, S. Groepper, M. L. Reineke, and W. H. Schacht. *In press.* Attendance patterns and survival of Western Meadowlark nests under video observation in the Nebraska Sandhills. Studies in Avian Biology.

Martin, D. R., L. A. Powell, and K. L. Pope. 2012. Habitat Selection by Adult Walleye during Spawning Season in Irrigation Reservoirs: A Patch Occupancy Modeling Approach. Environmental Biology of Fishes 93:589-598.

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NEWS BRIEFS

Extension Drought Website

UNL Extension has a new website that offers resources from the Institute of Agriculture and Natural Resources and others for dealing with regional drought.

The site is at droughtresources.unl.edu.

"As we Nebraskans know, our weather brings new challenges every year," said Kathleen Lodl, UNL Extension associate dean. "Last year it was flooding, this year it's drought.

"By all accounts," Lodl added, "it appears the 2012 drought may be one for the record books. While we can't control that, we can do our best to manage water resources to mitigate damage. That's what we're committed to in UNL Extension."

The new site includes links to information on crops, livestock, economics, water, families, and home and garden. It will include the latest weather forecasts from state climatologist Al Dutcher, as well as links to "Market Journal", CropWatch, «Backyard Farmer,» Extension publications; UNL news releases; and links to a number of key resources outside the university.

For the latest drought updates from IANR, follow on Twitter @ IANRNewsService.

EPA Stormwater Management Competition

The U.S. Environmental Protection Agency (EPA) has launched a new design competition called the Campus RainWorks Challenge to encourage student teams on college and university campuses to develop innovative approaches to stormwater management. Stormwater is a major cause of water pollution in urban areas in the U.S., impacting the health of people across the country as well as tens of thousands of miles of rivers, streams, and coastal shorelines, and hundreds of thousands of acres of lakes, reservoirs, and ponds.

The competition will help raise awareness of green design and planning approaches at colleges and universities, and train the next generation of landscape architects, planners, and engineers in green infrastructure principles and design.

Student teams, working with a faculty advisor, will submit design plans for a proposed green infrastructure project for their campus. Registration for the Campus RainWorks Challenge opens September 4, and entries must be submitted by December 14, 2012. Winning entries will be selected by EPA and announced in April 2013. Winning teams will earn a cash prize of $1,500 - $2,500, as well as $8,000 - $11,000 in funds for their faculty advisor to conduct research on green infrastructure.

More information on the Campus RainWorks Challenge is at http://water.epa.gov/infrastructure/greeninfrastructure/crw_challenge.cfm

Where Lincoln's Water Comes From

Sources of drinking water, both bottled and from the tap, include rivers, lakes, streams, ponds, reservoirs, springs and wells. Lincoln's water comes from a self-replenishing source that is naturally high in quality.

Lincoln's water comes from wells where the groundwater is under the direct influence of surface water. In 2011, more than 11.7 billion gallons of water were pumped from these wells to serve the 258,000 people who use an average of about 32 million gallons of water each day.

More information on Lincoln's water system is online at Lincoln.ne.gov

(From the Lincoln Water System Annual Drinking Water Quality Report for 2011).

WasteCap Nebraska

WasteCap Nebraska will be holding a Sustainability Summit in Omaha and Lincoln on October 9 and 10 with UNL's East Campus hosting some of the Lincoln events.

Keynote speaker will be Auden Schendler at 3 p.m. October 10 in the Great Plains Room of the East Campus Union. For more information, go to http://www.wastecapne.org/sustainability-summit/2011-wastecap-nebraska-sustainability-summit/ or contact Neil Tabor at (402) 709-6564.

Extension Courses Now Online

UNL Extension has launched two online short courses on irrigation and soils at marketplace.unl.edu. They combine the convenience and flexibility of online learning with the opportunity to obtain continuing education unit (CEU) credits.

The modules are intended for crop consultants, agency personnel, crop producers and others interested in improving their soil science or soil fertility management and irrigation management skills.

The soils course aims to expand the participant's knowledge of soil science, including the origins, physical properties and chemical properties of soil. Understanding this information benefits those making management decisions related to soil fertility and crop production. This in turn can improve the efficiency of fertilizer applications, reduce nutrient loss and improve crop yields.

The irrigation management course will help increase awareness and understanding of irrigation management concepts. Agricultural water users can optimize water use efficiency and protect the quality of water resources by applying basic information about irrigation systems, crop water use and management practices.

Reducing irrigation application amounts and increasing uniformity of application leads to reduced deep percolation and runoff. The result can be reduced irrigation costs, increased efficiency, increased yields and reduced surface and groundwater contamination.

Formal admission to UNL is not required to enroll in the short courses.

Register online at http://marketplace.unl.edu/extension/registration. Registration for each course is $50. CEU credit is available for an additional $10 per credit with a maximum of 13 credits per course.

Contact Chuck Burr at chuck.burr@unl.edu for details on the irrigation short course and Keith Glewen at kglewen1@unl.edu for information on the soils short course.

Fremont Wins Water Taste Test

The American Water Works Association (AWWA) announced in June that the Fremont Department of Utilities won their annual "Best of the Best" Water Taste Test. The event, composed of regional winners from water-tasting competitions across North America, was held at AWWA's Annual Conference and Exposition (ACE12) in Dallas, Texas.

Fremont gets its water from nine groundwater wells in the High Plains Alluvial Aquifer, with an average well depth of 90 feet. The utility pumps five million gallons per day through 160 miles of water main to serve 28,000 people.

Second place went to Jordan Valley Water Conservancy District of Herriman, Utah and third place was awarded to Arcadia Water of Arcadia, Wis. A judging panel rated each water system on its flavor characteristics.

Previous winners are Greenville, SC (2011), Stevens Point, Wis. (2010), Macon (GA) Water Authority (2009), the Louisville (KY) Water Company (2008), Oklahoma City Water and Wastewater Utility (2007) and Illinois American Water, Champaign District (2006 and 2005).

Survey *continued from back cover*

4. The Water Current provides timely and important information that I find useful.

___ Strongly agree

___ Mostly agree

___ Mostly disagree

___ Strongly disagree

5. Do you read each *Water Current* you receive?

___ Yes ___ No

6. Do you circulate your *Water Current* to anyone else?

___ Yes (if so, how many others _____) ___ No

7. Should the *Water Current* be distributed

___ More often

___ less often

___ remain a quarterly

8. Do you ever access the PDF copy of the *Water Current* that is on the Water Center's web site at http://watercenter.unl.edu?

___ Yes ___ No

9. What can we do to improve the appearance and/or readability the *Water Current*?

_____

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_____

10. Additional comments (include address corrections, email address or other updates to your mailing information):

_____

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_____

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Help Us Publish a Better *Water Current*

Help us publish a better W*ater Current.*

Take a few moments to complete this questionnaire and return it to us. If you do, we will enter you in a drawing for Water Center ball caps and umbrellas. To be eligible for these drawings, return your completed survey to Steve Ress, UNL Water Center, P.O. Box 830979, University of Nebraska, Lincoln, NE 68583-0979 or FAX it to (402) 472-3610 by Friday, Sept. 28. UNL subscribers may return surveys via campus mail to 516 HarH, EC, 0979.

Mail or FAX the entire page (so we have your name and address for the drawings).

Survey responses and names of responders are confidential to the *Water Current's* editorial staff.

1. Rank, in order of importance, the usefulness of the following general areas of the *Water Current* (1 - most important to 7 - least important):

___ News Briefs
___ Meet the Faculty
___ Reporting on upcoming events, seminars, conferences, tours, etc.
___ Director's Notes
___ Reporting on water and environmental research, survey and outreach activities
___ Featured Partners
___ What's happening with the Water Sciences Laboratory

2. What would you like to see in upcoming issues of the *Water Current*?

_____

_____

3. What are your primary water and environmental interests?

_____

_____

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